CSCI 5355 - ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

CREDIT HOURS: 3
PREREQUISITES: Graduate Standing and Nine Advanced Hours of CSCI
GRADE REMINDER: Must have a grade of C or better in each prerequisite course.

CATALOG DESCRIPTION

Use of computers in problem solving involving information representation, searching, theorem proving, and pattern matching with substitution. Methods for knowledge representation, searching, spatial, temporal and common sense reasoning, and logic and probabilistic inferencing. Applications in expert systems and robotics.

PURPOSE OF COURSE

To introduce basic concepts and techniques of artificial intelligence and provide insights into active research areas and current applications.

EDUCATIONAL OBJECTIVES

The goal of this course is to have students develop concepts and skills associated with problems that are classified as requiring intelligence for their solution. These problems require solution strategies that use searching, pattern matching, knowledge representation, machine learning, reasoning, uncertainty, and the ability to perform "common sense" processing. Evaluation will be based on successful completion of laboratory assignments, performance on homework, and analysis of exam responses.

Upon successful completion of the course, students should be able to:

1. Demonstrate knowledge of the issues, concerns, and problem in computationally solving problems that are usually solved by humans.
2. Demonstrate skills in problem analysis and solution design where searching, pattern matching, and substitution are the primary tools.
3. Apply analysis techniques to logic problems using propositional calculus and predicate calculus.
4. Describe artificial intelligence applications including, production systems, expert systems, robotics, natural language processing, and computer vision.
5. Demonstrate problem solving techniques to include spatial, temporal, qualitative, and common sense reasoning.
6. Program in symbolic manipulation languages including LISP and Prolog.
7. Discuss active research areas and examples.

COURSE CALENDAR

This course meets for a minimum of 37.5 lecture contact hours during the semester. Students have significant assignments based on readings from the primary literature, participate in classroom discussions regarding current research topics, complete periodic homework and laboratory/programming assignments, and periodic exams in addition to the final exam. Students are expected to prepare for any class assignments or quizzes over the material covered in class or in the reading material. Successful completion of these

activities requires at a minimum six additional hours of outside of classroom work each week.

CONTENT	**Hours**
Overview of Artificial Intelligence, History, Approaches, and Debates	3
Introduction to a symbolic manipulation language (LISP)	6
Production systems and pattern matching	2
Knowledge Representation and Issues Notational systems Trees, graphs, hierarchies, propositional and predicate logics, frames, semantic networks, constraints, conceptual dependencies, database, knowledge discovery in databases (KDD)	5
Search State-space representations Depth-first, breadth-first, heuristic search Planning and game playing Genetic algorithms	5
Logical Reasoning Predicate Calculus resolution, completeness, and strategies Unification, Prolog, monotonic and non-monotonic reasoning	5
Probabilistic Reasoning Probabilistic inference networks Fuzzy inference rules, Bayesian rules, Dempster-Shafer Calculus	5
Learning Knowledge acquisition, classification rules, self directed systems	3
Planning and Common Sense Reasoning Robot actions, strips, triangle tables, case based reasoning, spatial and temporal formalisms.	3
Neural networks Principles, biological analogies Training (techniques and errors) Recognition	3
Expert Systems Organization, tools, limits, examples	5
Exams	3
TOTAL	45

REFERENCES

Bratko, I., Prolog, 2nd Ed., Addison-Wesley, 1990.

Charniak, E., and McDermott, D., Introduction to Artificial Intelligence, Addison-Wesley, 1987.

Dean, T., Allen, J., and Aloimonos, Y., Artificial Intelligence Theory and Practice, Benjamin/Cummings, 1995.

Giarratano, J., and Riley G., Expert Systems Principles and Programming, PWS-KENT, 1989.

Luger, G., and Stubblefield, W., Artificial Intelligence , 2nd Ed., Benjamin/Cummings, 1993.

Nilsson, N. J. Principles of Artificial Intelligence, Tioga, 1980.

Rich, E. and K. Knight Artificial Intelligence, 2nd Ed., McGraw-Hill, 1991.

Russell S., and Novig, P., Artificial Intelligence A Modern Approach, 1995.

Tanimoto, S. L. The Elements of Artificial Intelligence Using Common Lisp, 2nd Ed., W. H. Freeman, 1995.